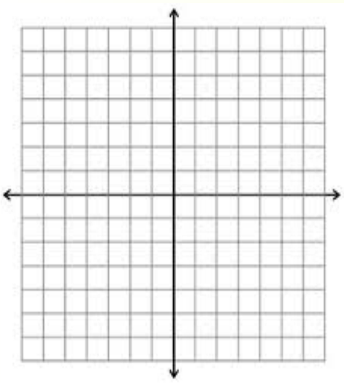
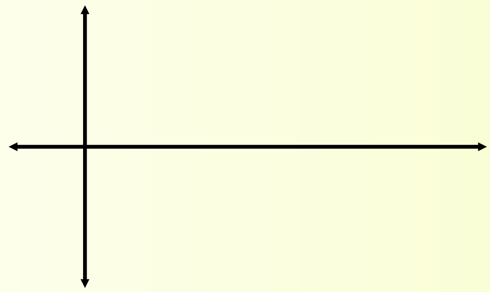
Alg. 2 Warm Up #10-1

Graph. Label important features:

1. $y = \dfrac{1}{x+3} - 2$



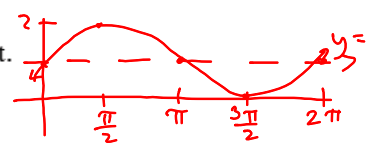
2. $y = \sin x$



Preview

HW Questions:

7-116. Imagine the graph $y = \sin(x)$ shifted up one unit.



a. Sketch what it would look like.

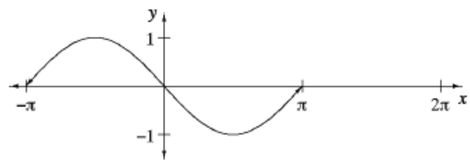
b. What do you have to change in the equation $y = \sin x$ to move the graph *up* one unit? Write the new equation. $y = \sin x + 1$

c. What are the intercepts of your new equation? Label them with their coordinates on the graph. x-int: $\left(\frac{3\pi}{2} + 2\pi n, 0\right)$ y-int: $(0, 1)$

d. When you listed intercepts in part (c), did you list more than one x-intercept? Should you have?

yes, there are infinite. 2π multiples of $\frac{3\pi}{2}$

7-117. The graph at right was made by shifting the first cycle of $y = \sin x$ to the left.



a. How many units to the left was it shifted?

b. Figure out how to change the equation of $y = \sin x$ so that the graph of the new equation will look like the one in part (a). If you do not have a graphing calculator at home, sketch the graph and check your answer when you get to class.

7-118. Which of the situations below (if any) is best modeled by a cyclic function? Explain your reasoning.

a. The number of students in each year's graduating class.

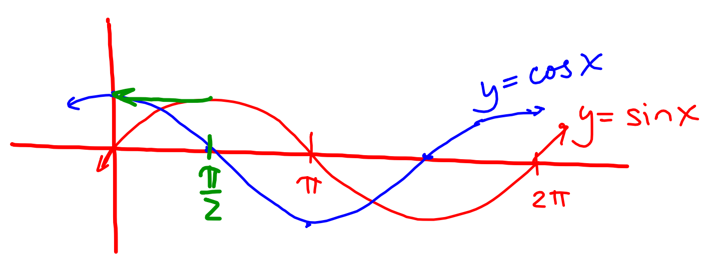
b. Your hunger level throughout the day.

c. The high-tide level at a point along the coast.

(skip 119)

7-120. Should $y = \sin x$ and $y = \cos x$ both be parent graphs, or is one the parent of the other? Give reasons for your decision.

Don't need to. $y = \cos x$ is just the sine graph shifted left $\frac{\pi}{2}$



$$\cos x = \sin\left(x + \frac{\pi}{2}\right)$$

7-121. Find the equation of the exponential function of the form $y = ab^x$ that passes through each of the following pairs of points.

a. $(1, 18)$ and $(4, 3888)$

b. $(-2, -8)$ and $(3, -0.25)$

7-122. Solve each of the following equations. Be sure to check your solutions.

a. $\frac{3}{x} + \frac{2}{x+1} = 5$ $\longrightarrow$

$$\frac{2}{x+1} = \frac{5\cancel{x}}{\cancel{x}} - \frac{3}{x}$$

$$\frac{2}{x+1} = \frac{5x-3}{x}$$

Now cross multiply.

b. $x^2 + 6x + 9 = 2x^2 + 3x + 5$

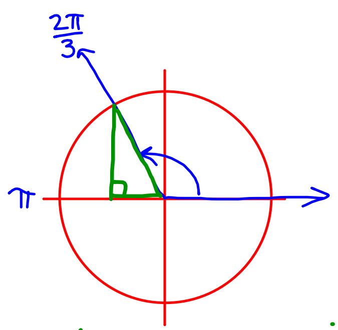
c. $8 - \sqrt{9-2x} = x + 3$

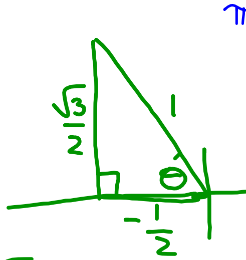
$$\begin{aligned} -8 \qquad\quad & -8 \\ -\sqrt{9-2x} &= x - 5 \\ \left(\sqrt{9-2x}\right)^2 &= (5-x)^2 \\ 9 - 2x &= 25 - 10x + x^2 \\ 0 &= x^2 - 8x + 16 \\ 0 &= (x-4)^2 \\ x &= 4 \end{aligned}$$

7-123. Evaluate each of the following expressions exactly.

a. $\tan\frac{2\pi}{3}$

b. $\tan\frac{7\pi}{6}$





$\theta' = \frac{\pi}{3}$, special Δ ratios.

$\tan \rightarrow \frac{y}{x}$

$$\frac{\frac{\sqrt{3}}{2}}{-\frac{1}{2}} = \boxed{-\sqrt{3}}$$

Friday's CP's: (Just read)

7-114. With your team, you will apply your knowledge about transforming graphs of functions to transform the graphs of $y = \sin x$ and $y = \cos x$ and find their general equations.

Your Task: As a team, investigate $y = \sin x$ and $y = \cos x$ completely. You should make graphs, find the domain and range, and label any important points or asymptotes. Then make a sketch and write an equation to demonstrate each transformation of the sine or cosine function you can find. Finally, find a general equation for a sine and a cosine function. Be prepared to share your summary statements with the class.

Discussion Points

What can we change in a cyclic graph?

Which points are important to label?

How can we apply the transformations we use with other functions?

Are there any new transformations that are special to the sine function?

Further Guidance

7-115. Sketch a graph of at least one cycle of $y = \sin x$. Label the intercepts. Then work with your team to complete parts (a) through (c) below.

a. Write an equation for each part below and sketch a graph of a function that has a parent graph of $y = \sin x$, but is:

i. Shifted 3 units up.

ii. Reflected across the x-axis.

iii. Shifted 2 units to the right.

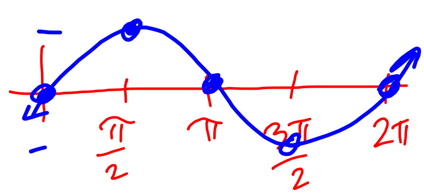
iv. Vertically stretched.

b. Which points are most important to label in a periodic function? Why?

c. Write a general equation for the family of functions with a parent graph of $y = \sin x$.

Further Guidance section ends here.

Change to: shift right $\frac{\pi}{2}$



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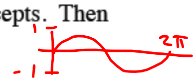


a. Write an equation for each part below and sketch a graph of a function that has a parent graph of $y = \sin x$, but is:

i. Shifted 3 units up.

ii. Reflected across the x-axis.

iii. shift right $\frac{\pi}{2}$

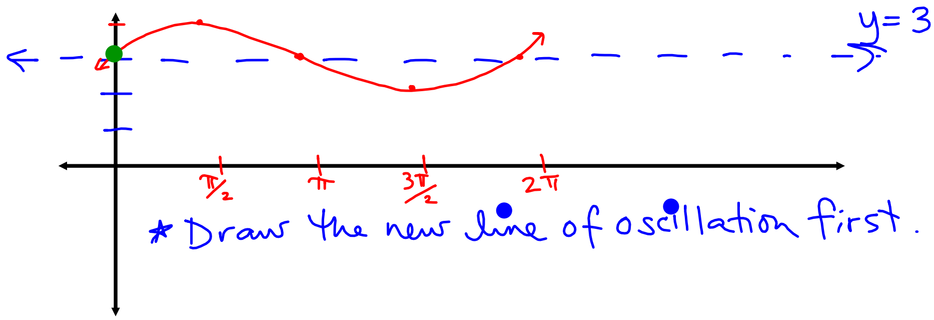
iv. Vertically stretched.

b. Which points are most important to label in a periodic function? Why?

intercepts, max & min.

c. Write a general equation for the family of functions with a parent graph of $y = \sin x$.

$$y = a\sin(x-h)+k$$

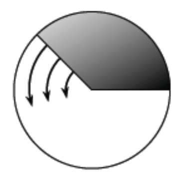


* Draw the new line of oscillation first.

CP's: 7- # 126 ---> 128

7-126. THE RADAR SCREEN

Brianna is an air traffic controller. Every day she watches the radar line (like a radius of a circle) go around her screen time after time. On one particularly slow travel day, Brianna noticed that it takes 2 seconds for the radar line to travel through an angle of $\frac{\pi}{6}$ radians. She decided to make a graph in which the *input* is time and the *output* is the distance from the outward end of the radar line to the horizontal axis.



x-axis is time in seconds

Your Task: Following the input and output specifications above, make a table and graph for Brianna's radar.

secs x	θ	$y = \sin\theta$
0	0	0
2	$\pi/6$	0.5
4		
6		
⋮		

Discussion Points

How can we calculate the outputs?

How is this graph different from other similar graphs we have made?

How long does it take to complete one full cycle on the radar screen? How can we see that on the graph?

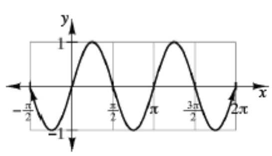
7-127. Now that you have seen that it is possible to have a sine graph with a cycle length other than 2π, work with your team to make conjectures about how you could change your general equation to allow for this new transformation.

a. In the general equation $y = a\sin(x-h)+k$, the quantities a, h, and k are called **parameters**. Where could a new parameter fit into the equation?

b. Use your graphing calculator to test the result of putting this new parameter into your general equation. Once you have found the place for the new parameter, investigate how it works. What happens when it gets larger? What happens when it gets smaller?

c. Write a general equation for a sine function that includes the new parameter you discovered.

7-128. Another word for cycle length is **period**. Which of the following have a period of 2π? Which do not? How can you tell? If the period is not 2π, what is it?

a. 

b. A pendulum takes 3 seconds to complete one cycle.

c. $y = \sin\theta$

d. A radar line takes 1 second to travel through 1 radian.

HW: 7-

#129 ---> 137